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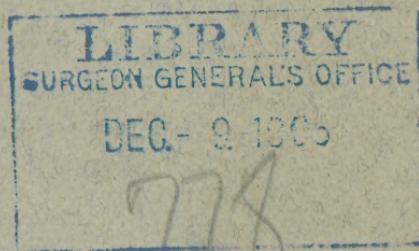
Typhoid Fever at the Massachusetts General Hospital During the past Seventy-eight Years

MORTALITY; INTESTINAL HEMORRHAGE; PERFORATION;
RELAPSE

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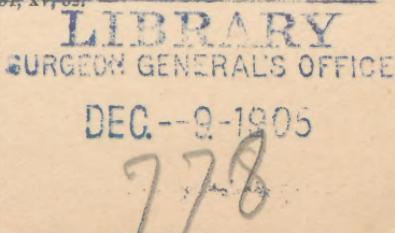
TYPHOID FEVER AT THE MASSACHUSETTS GENERAL
HOSPITAL DURING THE PAST SEVENTY-EIGHT YEARS.
MORTALITY; INTESTINAL HEMORRHAGE; PERFORA-
TION; RELAPSE.¹

BY REGINALD H. FITZ., M.D., BOSTON.

THE recognition in this country of typhoid fever as an independent disease and its identification with the typhoid fever of Paris were the outcome of investigations carried on at the Pennsylvania Hospital in Philadelphia and at the Massachusetts General Hospital in Boston. The discoveries in the first quarter of this century of the French pathologists, above all, of Louis, received but little attention from the American physicians of that period. In fact, the observations on typhoid fever of this eminent physician were known to James Jackson, professor of the theory and practice of physic in Harvard University, only through a review in the *Edinburgh Medical and Surgical Journal* for 1830, until the return from Paris, three years later, of his son, James Jackson, Jr. This gifted young physician, in the words of Dr. Osler, "the young Marcèllus among the physicians of the country," between 1831 and 1833 was a fellow-student in Paris of William W. Gerhard, and Casper W. Pennock, both of Philadelphia. These young men became devoted followers and admirers of Louis Jackson, in particular, came into such intimate personal relations with him as to look upon him as a second father. Louis has placed on record the warmth of his friendship for the younger Jackson and his thorough appreciation of his exceptional talent for the observation of disease. Dr. Gerhard, soon after his return to Philadelphia in 1833, received the appointment of resident physician in the Pennsylvania Hospital, occupying this subordinate position for the purpose of devoting himself for a while to medical research. The results of his study of typhoid fever were published in the following year.² James Jackson, Jr., within two weeks after his return from Paris, closely examined the cases of disease in the Massachusetts General Hospital (both in the wards and in the autopsy-room) until he was taken sick with typhoid fever. Soon after recovery from this disease he died of dysentery, early in 1834, just as he was about to begin the practice of medicine in Boston. Although his opportunity of active research at the hospital was limited to a few weeks only, his influence seems to have been the most powerful factor in bringing

¹ Read before the New York State Medical Association, October 25, 1899.

² American Journal Medical Sciences, 1834, xv, 32.



about, both in the hospital and in New England, the more exact knowledge of the nature of typhoid fever. Until his return the examination of the intestines in this disease was not properly conducted; indeed they were most frequently left unopened. Within six weeks after his investigations were begun the evidence obtained with regard to typhoid fever was strongly corroborative of the observations of Louis. "He found that this disease exhibited in the living and in the dead the same characters which his master had so accurately delineated."³

The names of two other Bostonians, Drs. Bowditch and Shattuck, also pupils of Louis, and who eventually became physicians to the Massachusetts General Hospital, likewise were intimately connected with the early history of typhoid fever. Henry I. Bowditch in 1832 was a fellow student in Paris of the younger Jackson and shared in his enthusiastic admiration for Louis. He translated the "Recherches Anatomiques" of this author,⁴ and thus in 1836 opened to most of the practitioners of the United States and of the British Kingdom what hitherto had been a sealed book. Geo. C. Shattuck, Jr., was sent to England by Louis in 1838 to observe the cases of continued fever in that country, all of which were then regarded as the one affection, *typhus*, with the view of determining to what extent they resembled and differed from those occurring in Paris. He found examples of both *typhus* and of *typhoid fever* and reported that the latter disease in England was identical with the one observed by Louis in France. His investigations were communicated to the Society for Medical Observation in Paris and were published subsequently in Philadelphia.⁵

The influence of James Jackson, Jr.'s, work at the hospital was first made evident in June, 1838, when his father presented to the Massachusetts Medical Society a "Report founded on the Cases of Typhoid Fever, or the Common Continued Fever of New England, which occurred in the Massachusetts General Hospital from the Opening of that Institution in September, 1821, to the End of 1835."⁶

The number of cases serving as the basis of this report was 303, but reference to the records of the hospital during this period shows that they were entered as *typhus*, *enecia*, *enecia typhus*, *enecia synochus* and *enecia cauma*. These diagnoses at some later period were overwritten by the term *typhoid fever*. Dr. Jackson, in the paper now under consideration, was led, "after much hesitation," to use the term *typhoid fever* through the in-

³ Memoir of James Jackson, Jr., M.D., 1835, p. 40

⁴ Anatomical, Pathological and Therapeutic Researches on Gastroenterite, Putrid, Adynamic, Ataxic or Typhoid Fever. By P. Ch. A. Louis. Translated by Henry I. Bowditch, M.D. Two vols., 1836.

⁵ Medical Examiner, 1840, iii, 133.

⁶ Medical Communications, Massachusetts Medical Society, 1841, vi, 79.

fluence of Dr. Gerhard, although he had recognized in 1833 the identity of the continued fever of Boston with that described by Louis.

During the earlier part of the period covered by the report Dr. Jackson thought that in most cases the early use of active remedies, especially of antimony, would diminish the violence of the fever and, in many instances, would arrest it.⁷ In almost all the patients, therefore, "vomiting or full purging or both, were induced by medicine, in the first or second week of the disease."⁸ After 1831 emetics were used much less frequently than before, although but few patients were allowed to go without a cathartic, and between 1833 and 1835 cathartics were not used as often after the first day in a large proportion of the cases. Mercurials, almost exclusively calomel, were employed during the first or second week until the mouth was made sore, but after 1830 their use almost entirely ceased.

In 1833, however, doubts arose, especially in the mind of one of his colleagues, as to the benefit of any continued active treatment. Notwithstanding these doubts, Dr. Jackson, from 1833 to 1835, during the first week of the disease, usually prescribed tartar emetic every two hours in constantly increasing quantity, until it was ascertained how large a dose the patient could bear. It was found that from one-half a grain to four grains thus could be taken without any important effect upon the stomach or bowels. Bleeding was used in one-fifth of the cases, not as a remedy for the disease, but always with reference to particular symptoms, and opium was given to check diarrhea and cough, to procure sleep, and to alleviate pain.

Dr. Jackson concluded, apparently by deduction according to the numerical method of Louis, that at the onset of typhoid fever the patient should receive an emetic, followed by a cathartic, or the two should be given in combination. If the vomiting and purging were not followed by great relief, venesection was to be practised on the following day unless the patient's constitution was very feeble or the attack mild. If the disease did not subside after the evacuations, tartar emetic was to be given every two hours in increasing doses, the bowels being kept open in the meantime. It was advised that calomel should enter into the medicines used for this purpose. Evacuations, at least vomiting and purging, might be resorted to in the second week, and some benefit might be obtained if the use of small doses of antimony was begun in this week. After the second week no active treatment was to be employed, at all events none which would cause any serious inconvenience to the patient.

⁷ Memoir, p. 41.

⁸ Medical Communications, Massachusetts Medical Society, 1841, vi, 91.

As a result of Dr. Jackson's experience, but not capable of being demonstrated by the numerical method, was his adherence to the mildest articles of liquid diet until the patient was "fully reinstated." Then extra food was allowed cautiously, the caution being the more necessary the earlier the return of the appetite. Vinous liquors might be tried if desired by the patient when greatly enfeebled at a late stage of the disease.

In the following year, 1839, Enoch Hale, attending physician of the hospital, also addressed the Massachusetts Medical Society on the subject of typhoid fever.⁹ His paper was based chiefly upon his experience at the hospital from October 1833 to 1839, during which years 197 cases had been admitted. The former date was selected since it represented the time at which especial attention began to be directed to the study of the symptoms and lesions of this affection. He stated that the knowledge of the disease of Peyer's glands in typhoid fever "serves to guard us especially against inappropriate, irritating medicines, such as were formerly in use, in the expectation of arresting the progress of the fever. . . . Up to a very recent period, if it be not so in some places even now, it was a common practice to give not only antimonials, but irritating cathartics, not only occasionally to evacuate the intestines, but daily, and several times a day, to 'break up' or arrest the progress of the disease, or to cure diarrhea by removing the supposed cause of irritation.¹⁰ 'Hence the necessity of a mild and unstimulating diet during convalescence as well as during the more active period of the disease,' and most important . . . to abstain from attempting too much by active treatment. . . . Violent, persevering efforts to arrest the disease, after it has fairly begun its course, cannot be successful. They may do much harm by increasing the irritation and inflammation; but it is scarcely possible that they can do good. We may allay the general irritability of the system, we may watch against the attack of unfavorable symptoms, we may soothe the irritated state of the intestinal canal, and, sometimes, perhaps moderate the severity of its local inflammation, and thus contribute greatly both to the comfort and the restoration of our patient. In the beginning of disease, before the process of inflammation is fully established, we may, perhaps, do more, and by early removing the causes of irritation, prevent its formation, and cut short its course. It is only then that active remedies can be used with benefit, or even with safety. If persevered in at a later period, they may exhaust the patient, but they will not subdue the disease."¹¹

⁹ Remarks on the Pathology of the Typhoid Fever of New England as exhibited in its Physical Signs, and its Anatomical Appearances. Medical Communications, Massachusetts Medical Society, 1841, vi, p. 183.

¹⁰ Loc. cit., p. 253

¹¹ Medical Communications, Massachusetts Medical Society, 1841, vi, p. 255.

During the past sixty years the treatment of typhoid fever at the hospital has not varied materially from the plan pursued by Dr. Hale and his colleagues. For the purpose of more exact information with regard to the modifications in carrying out this plan and their results, my former assistant, Dr. Louis W. Gilbert, has undertaken the laborious task of examining the original records. He has prepared a table (see pages 10 and 11), which shows the mortality in successive years and the frequency of intestinal hemorrhage, perforation and relapse. The results of this investigation are presented for your consideration.

For the entire period of seventy-eight years but one volume of the clinical records of the medical cases is missing, namely, Volume CCCI, covering a part of the year 1871. The number of patients with typhoid fever assigned to this year, therefore, is probably somewhat smaller than was actually the fact, and the data obtained for 1871 are less valuable for purposes of comparison than would have been the case were the missing volume at hand. The table includes only those cases of typhoid fever which were treated in the hospital for a longer period than two days. Convalescents from typhoid, admitted for the purpose of recovery from the effects of the disease, are not entered in the lists. With these exceptions the total number of patients included is 3,127 from 1839 to 1899, and 3,538 from the admission of the first patient in 1821 to the year 1899. The average mortality for the seventy-eight years from the opening of the hospital is 14.3 per cent., and for the past sixty years it is 14.7 per cent. The percentage of mortality in successive decades does not differ widely from the above figures, as appears from the following statement:

Decade.	Mortality.
1829 to 1839.	11.8%
1839 " 1849.	11.1 "
1849 " 1859.	16 "
1859 " 1869.	15.9 "
1869 " 1879.	16.6 "
1879 " 1889.	14.7 "
1889 " 1899.	13.5 "

The years of low mortality were, 1837, no deaths; 1835, 2.8 per cent.; 1846, 3.4 per cent., and 1877, 4.2 per cent. On the other hand, years of unusually high mortality were, 1843, 26.6 per cent.; 1857, 27.2 per cent.; 1878, 31.2 per cent. and 1868, 40 per cent. That these variations were independent of any sudden changes in treatment will appear from contrasting them with the mortality in contiguous years. Although in 1855 the mortality was only 2.8 per cent., in 1854 it was 12.5 per cent., and in 1856 it was 13.6 per cent., while in 1857 it was 27.2 per cent. In 1877 the mortality was 4.2 per cent. and in 1878 it was 31.2 per cent. The highest mortality in any one year was 40 per cent. in 1868, but in 1867 it was 18.9 per cent. and in 1869 it was 12.9 per cent.

Such variations in mortality and an appreciable prolongation of the period of convalescence led Dr. Jackson, in 1838, to question whether the increased fatality and the prolonged convalescence during the period of radical changes in the treatment from 1833 to 1835, inclusive, were due to the greater severity of the disease or to the less active treatment during this period. It would appear from his concluding advice that he preferred to return to the more active treatment to which he had long been accustomed than to recommend the blander methods preferred by some of his colleagues, and of which he had made a trial for a number of years. Dr. Hale,¹² on the contrary, in the following year answered Dr. Jackson's query by stating that during the three years subsequent to the period included in Dr. Jackson's report the treatment was perhaps even milder than ever before. Although the mortality from 1833 to 1835, inclusive, was from 16 per cent. to 17 per cent., it fell to 10 per cent. in 1836. In 1837 there were no deaths; in 1838 the mortality was 5 per cent. and the average mortality for the three years was in the vicinity of 6 per cent. The higher mortality of the earlier years was attributed, therefore, by Dr. Hale to the difference in the severity of the disease at different periods.

Although the study of the above table makes it doubtful if modifications of treatment carried on at the hospital have produced any essential change in the death-rate, it is desirable to consider this question from the other side and inquire what changes, if any, have followed alterations of treatment.

For the thirty years after the publication of Dr. Hale's paper, namely, from 1839 to 1869, the diet of the patients was liquid, the fluids often containing some farinaceous ingredient. From 1869 to 1879 beef tea and beef juice were largely used in addition to the milk, and from 1879 to 1899 the liquid portion of the diet has been chiefly milk. Between 1893 and 1898 the patients under the care of Dr. F. C. Shattuck have received, in addition to the milk, minced meat, raw and soft-boiled eggs, macaroni, soft crackers, toast and puddings. Patients under the care of Dr. E. G. Cutler during a like period have been fed on skim milk, buttermilk, eggs and milk, albumin water, chicken broth, and beef juice with barley water. The mixed foods were so strained as to be freed from solid particles.

During the thirty years of liquid, farinaceous diet, the average mortality was 14.1 per cent. In the milk and beef tea decade it was 16.6 per cent., although in the immediately preceding liquid, farinaceous decade it was 15.9 per cent. From 1879 to 1899, among those patients using milk as the principal article of food, the mortality was 14.6 per cent., which was about the same as during the

¹² Medical Communications, Massachusetts Medical Society, 1841, vi, p. 254.

period of liquid, farinaceous diet. The mortality was only 11.3 per cent., however, among the patients between 1893 and 1898 who were fed upon the liquid and soft-solid diet prescribed by Dr. Shattuck. This mortality compares very favorably with that of 15.1 per cent. noted among the patients using a largely milk diet, and with the 16.6 per cent. mortality occurring among patients taking strained, starchy and proteid fluids.

Since 1839 emetics and purgatives have no longer been in use and antimony has been discontinued. Calomel has been employed only occasionally in the decade following 1838, and again in 1887, when ten grains of calomel were given as a matter of routine to about one-half of the patients when they entered the hospital. The treatment in general use consisted of an alkaline fever mixture, mild laxatives or chalk mixture and laudanum, as the condition of the bowels might demand. After 1868 rectal enemata instead of laxatives by the mouth were used when a movement of the bowels was desired. In 1878 quinine and other antipyretic drugs were added to or substituted for the alkaline fever mixtures, and were used with greater or less frequency during the subsequent ten years. The external use of water in the treatment was begun in 1873. At first some of the patients were sponged with tepid water two or three times daily. From 1878 to 1888, however, the frequency of the sponging was increased to six or eight times a day, and the temperature of the water was often as low as 65° F. Since 1888 sponge baths and tub baths, at a temperature of 65° F. and upwards, have been in constant use as often as every four hours when the temperature of the patient was 102.5° F. As the average mortality from 1878 to 1888 was 16 per cent., and that from 1888 to 1898 was 13.5 per cent., it is evident that a definite lowering of the rate has taken place during this period of cold-water treatment. It does not follow, however, that this change for the better was due to the use of cold water, since a lowering of the mortality of even 5 per cent. in successive decades took place between 1839 and 1859, wholly independent of any obvious modification of treatment. It remains to be learned whether the external use of cold water and the changes in diet have been attended with variations in the occurrence of such complications of typhoid fever as intestinal hemorrhage, perforation and relapse.

In the earlier years of the hospital, patients with typhoid fever were allowed to walk to the closets for the purpose of emptying the bowels; hence, presumably, the occurrence of hemorrhage from the intestine was often overlooked. Notwithstanding this fact, Dr. Jackson¹³ notes 10 per cent. of hemorrhage from the bowels in his series of 303 cases.

From 1849 to 1899 the occurrence of intestinal hemorrhage is

¹³ Medical Communications, Massachusetts Medical Society, 1841, vi, 117.

recorded in 159 cases out of 2,767 patients, a ratio of 5.7 per cent. The extremes in the decades here included are 2.3 per cent. from 1859 to 1869 and 9 per cent. from 1889 to 1899. The table shows that during the last twenty years, and especially during the past ten years, hemorrhage from the bowels has been much more frequent than during the previous twenty years. Indeed, the average occurrence has been nearly as high in the past ten years as during the days of emetics and the active use of purgatives. That this is not a question of consistence of food appears probable from the study of the records between 1893 and 1899. In this period the frequency of intestinal hemorrhage among patients living chiefly on a milk diet was 10.6 per cent.; among those fed upon strained proteid and amylaceous fluids it was 16 per cent., while it was only 9 per cent. among the patients living upon fluids and soft solids. The inference from this comparison is: A diet of soft solids not only does not provoke intestinal hemorrhage, but also rather lessens the tendency to this complication. On the other hand, a strained mixed diet may increase somewhat the frequency of hemorrhage.

In like manner the question of perforation of the intestine has been investigated. The difficulties in the way of determining the occurrence of this complication of typhoid fever are obvious to all physicians. Its presence is suggested by the onset of symptoms of peritonitis, and is made apparent by the discovery of the perforation after a laparotomy or at a post-mortem examination. The symptoms of perforation may exist, however, and no perforation be found at a laparotomy or after death. Perforation, indeed, may have taken place and no characteristic symptoms have announced its occurrence. Bearing in mind these difficulties, all the cases of suspected perforation have carefully been scrutinized, and those instances only admitted to the table in which the perforation was demonstrated, or the clinical evidence was of the strongest possible nature. It is only within the past thirty years that the data were considered sufficient to permit comparisons to be made. From 1869 to 1879 the average frequency of perforations was 1.1 per cent., from 1879 to 1889 it was 0.3 per cent., and from 1889 to 1899 it was 1.6 per cent. These differences are so slight as to make it doubtful if diet or treatment has had any effect in modifying the tendency to this grave complication of typhoid fever. Of 10 patients with perforation between 1893 and 1897, five, or 2.8 per cent., were using a largely milk diet; two, or 1.8 per cent., strained liquid diet, and three, or 3.4 per cent., were fed upon liquid and soft-solid diet.

Any accurate observation concerning the frequency of relapse has been made trustworthy only since the introduction of the thermometer in the study of disease. Careful thermometric records

have been made at the hospital since 1869. From 1869 to 1879 the average frequency of relapse was 8.7 per cent.; from 1879 to 1889 it was 13.6 per cent., and from 1889 to 1899 it was 11.3 per cent. The average for the thirty years is 11.2 per cent. It may be that the increased frequency during the past twenty years is due largely, as has frequently been maintained, to the hydriatic treatment of the disease.

The possible influence of diet has also been considered. Under the largely milk diet the ratio of relapse was 13.1 per cent. It was 11.1 per cent. among patients living upon the strained proteid and amylaceous diet, and 10.2 per cent. among patients fed on fluids and soft solids. Relapses thus were rather more frequent among patients living upon a largely milk diet.

The conclusions reached from this study of the records of the Massachusetts General Hospital for the past seventy-eight years are as follows :

- (1) The treatment of typhoid fever does not differ in essentials from the principles laid down in 1839.
- (2) The average mortality from this disease has not materially changed from the days of active treatment with emetics, purgatives, venesection, antimony and calomel down to the present time.
- (3) Intestinal hemorrhage, perforation and relapse, upon the whole, are quite as frequent now as at any period in the history of the disease.
- (4) A considerable variety in diet may be permitted not only without detriment, but also with possible benefit to the patient.

Year.	No. cases.	Deaths.	Mortality Per cent.	Hemorrhage.	Per cent.	Perforation.	Per cent.	Relapse.	Per cent.
1821									
1822	1								
1823	5								
1824	15	3	20						
1825	18	2	11.1						
1826	26	3	11.5						
1827	19	3	15.7						
1828	22	2	9						
1821-1829	106	13	12.2						
1829	25	1	4						
1830	14	4	28.5						
1831	29	2	6.8						
1832	23	4	17.3						
1833	37	6	16.2						
1834	34	5	17.6						
1835	35	6	17.1						
1836	59	5	10.1						
1837	29								
1838	20	1	5						
1829-1839	305	36	11.8						
1839	33	4	8.3						
1840	40	7	17.5	1	2.5				
1841	11	1	9.1						
1842	15	1	6.6						
1843	15	4	26.6						
1844	38	7	18.4						
1845	36	1	11.1						
1846	29	1	3.4						
1847	90	5	5.5						
1848	53	6	11.3						
1839-1849	360	40	11.1	3	.8				
1849	36	5	13.9	2	5.5				
1850	32	5	15.6						
1851	37	7	18.9	3	8.1				
1852	31	6	19.3						
1853	32	5	15.6	2	6.2				
1854	32	4	12.5	1	3.1				
1855	36	1	2.8			1	3.1		
1856	22	3	13.6						
1857	33	9	27.2	1	3.3				
1858	27	6	22.2	1	3.7	1	3.7		
1849-1859	318	51	16	10	3.1	2	.6		

Year.	No. cases.	Deaths.	Mortality Per cent.	Hemorrhage.	Per cent.	Perforation.	Per cent.	Relapse.	Per cent.
1859	55	5	9	1	1.9				
1860	28	4	14.3	1	3.5				
1861	41	4	9.7						
1862	19	4	21.5	1	5.2				
1863	42	9	21.4	3	7.1				
1864	33	3	9	1	3.3				
1865	24	6	25						
1866	23	2	8.7						
1867	16	3	18.9						
1868	20	8	40						
1859-1869	301	48	15.9	7	2.3	1	.3		
1869	31	4	12.9						
1870	50	7	14	1	2				
1871	41	13	31.7	2	4.8	2	4.8	1	3.2
1872	45	5	11.1	1	2.2	1	2.2	3	6
1873	37	9	24.3	1	2.7			2	5.4
1874	27	3	11.1	1	3.7			2	7.4
1875	46	5	10.9	1	2.2			6	13.2
1876	39	6	15.4	4	10.2	1	2.5	6	15.4
1877	23	1	4.2	1	4.2			4	16.8
1878	16	5	31.2					5	31.2
1869-1879	355	58	16.6	12	3.4	4	1.1	31	8.7
1879	23	5	21.7	1	4.3			1	4.3
1880	52	4	7.7	2	3.8			7	13.4
1881	75	17	22.7	2	2.4			9	12
1882	56	10	17.8	5	8.9			4	7.1
1883	63	13	20.1	4	6.3	1	1.5	8	12.7
1884	74	17	22.9	4	5.4			14	18.9
1885	90	12	14.2	3	3.3			10	11.1
1886	84	12	14.3	2	2.3	1	1.1	16	25
1887	161	20	12.3	6	3.7			23	14.3
1888	115	17	14.7	11	9.5	1	1.1	16	13.9
1879-1889	793	127	16	40	5	3	.3	108	13.6
1889	119	13	10.9	11	9.1	4	3.3	17	14.2
1890	68	6	8.8	6	8.8			8	11.7
1891	98	16	16.3	8	8.1	2	2	8	8.1
1892	92	13	14.1	5	5.4			7	7.6
1893	81	9	11.1	4	4.9	2	2.4	9	11.1
1894	89	16	17.9	14	15.9	4	4.4	8	6.9
1895	88	16	18.1	12	13.6	1	1.1	10	11.4
1896	120	13	10.8	7	10.8	1	1.5	23	19.1
1897	86	11	12.8	11	12.8	2	2.3	4	4.6
1898	159	22	13.2	12	7.5			19	11.9
1889-1899	1,000	135	13.5	90	9	16	1.6	113	11.3

Totals, 1821-1899: Number of cases 3,538; deaths 509; mortality per cent. 14.3.

